

Hibernation and Winter Habits of Spiders.—The Rev. Dr. McCook remarked that the effect of a low temperature upon spiders was observed in the cases of several young specimens of *Theridion tepedariorum*. They hung on a few short lines to the plastered wall of a brick out-building, the plaster being laid directly on the brick, forming a very cold surface. The spiders were protected from the wind and snow, but wholly exposed to the frost. January 14 (1885), with thermometer ranging from 20° to 25° above zero (Fahrenheit), the spiders were hanging motionless. When touched by the tip of a pencil they dropped down in the usual manner of their kind, holding on by the out-spun threads which reached a length of over one foot. They ascended to their perch afterward, and crawled over the roof a little ways.

At a temperature of 18.6° they again were able to drop from the perch. January 19, with thermometer ranging from 17.5° to 20° , they seemed less active—one, when touched, dropping about one inch, another six inches. Four hours thereafter they were suspended in the same position. As the natural habit of the creature is to ascend in a moment or two after disturbance, this shows that the frost had somewhat affected the normal energy. But one of them, being gently lifted on the finger, moved its legs and very slowly began to ascend. Five hours thereafter it was at its perch against the roof. These spiders, at this temperature, with some variations (January 21), moved their position, one passing along the angle of the roof, a distance of four feet. This change of site was probably caused by the annoyance which the experiments produced.

February 11, the thermometer stood at zero at the City Signal Service Office; in West Philadelphia, where his observations were made, the temperature was lower. On the 12th, the Signal Service reported 1° above zero; at his house it was below zero. On this day he removed from its position one of the specimens, a young female about two-thirds grown, and placed it in his library where the temperature was summer heat. She was laid upon the table in the sun. The legs were drawn up around the cephalothorax in the usual "hunched" way when torpid or feigning death. There was a slight and regular pulsation of the feet. In less than ten minutes, upon being touched, she stretched forth her legs and began to move slowly over the paper upon which she had been placed. When touched, her motion was much accelerated, and she began vigorously to perambulate her bounds, anchored to and pulling out after her the usual drag-line. When lifted up on the tip of a pencil she spun out a long thread, to the end of which she hung in the little basket-like structure of silken cords which he had elsewhere described. Indeed, her action was in every respect normal, and showed a remarkably sudden and complete revival of activity after so long an exposure to such extreme cold.

February 26, a younger specimen, about one-third grown, hanging in a crevice in the site above described, when touched and lightly pressed down, slowly moved its legs and began to struggle back to its perch. The thermometer ranged from 20° to 25° ; on the day before the range was from 21° at 7 A. M., to 28° at 11 A. M.

During the six weeks over which these observations extended, the temperature was unusually low for this vicinity; for a great part of the time, the thermometer stood below freezing point, and several times reached zero. The month of March following was unusually severe, the thermometer frequently reaching winter temperature. On the first of April, however, the above-named spiders, and others of a younger brood, were in their webs hale and active, drawn out by the first soft days of spring. It would seem, therefore, that the hibernation of spiders (of this species, at least), is not accompanied with a great degree of torpidity; that they preserve their activity and spinning habit while exposed to cold ranging from freezing point to zero (Fahrenheit); that after long and severe exposure, the recovery of complete activity when brought into a warm temperature is very rapid, almost immediate; and that on the return of spring, even after a prolonged and severe winter, they at once resume the habits of their kind.

In all the above specimens the abdomens were full, indicating perfect health. Other spiders hung upon their webs with shriveled abdomens, quite dead, among them one of his specimens, a male, who died during the course of the observations. A *Pholcus phalangioides* hung thus dried up, holding with a death-grip to her web by the two fore-pairs of legs which supported the cephalothorax in a position parallel to the plane of the horizon, while the long abdomen hung down at right-angles thereto, and the third and fourth pairs of legs were drooped downward and backward. He could not determine that these and other spiders perished by the cold. The living individuals were all characterized by the plump abdomen, as though there had been little or no absorption of tissues for nourishment of life. There appeared to be no growth during hibernation.

The same facts hold good as to the winter habits of Orb-weavers. The young survive the winter in the admirably arranged cocoons provided by maternal instinct. But early in the spring many adults of both sexes are found nearly full-grown, who have also safely weathered the cold months. He had, at various times in midwinter, collected examples of *Epeira strix*, and had found the species adult in spring. Specimens of *Strix* may be frequently taken during the winter months from rolled leaves, within which they have weathered our hard frosts. These rolled leaves also serve for nests during summer. Dr. Geo. Marx had informed him that, on the capacious Government grounds in

Washington city, he often sees such curled leaves suspended conspicuously amid the verdureless branches, and had learned to recognize them easily as the winter-quarters of this species. It of course follows that, either from purpose or by the accidental unwrapping of the threads during continual journeys back and forth trailing her drag-line behind her, the spider prevents the leaf from falling.

A vast colony of *Epeira vulgaris* inhabits the boat-houses grouped around the inlet wharf at Atlantic City. Dr. McCook stated that he had once visited this colony, May 22, 1882. The season had been a remarkably backward one, cold, and very rainy. The trees on the island had not yet leaved; insect life had scarcely appeared; in short the season had advanced little further than the first of May in ordinary years. The inlet colony, however, had already appeared in large numbers, and had swung their orbs between the timbers of the houses and the piles which supported them. These were of various sizes, full-grown, half-grown, and young several weeks out of the cocoons. All the cocoons—which were thickly laid along the angles of the joists and cornices—were empty. The number of young spiders was, however, remarkably small, a fact which he could account for only on the supposition that in the absence of the usual insect food supply, the adults had been driven to prey upon the young and the young upon each other to an unusual degree. Many of the spiders were hanging in the centre of their round snares. Others—the greater part, indeed—were sheltered within a thick tubular or arched screen, open at both ends, which was bent in the angles of the woodwork, or beneath an irregular rectangular silken patch stretched across a corner.

Many others were burrowed behind cocoons, quite covered up by the thick flossy fibre of which these are composed. In this condition they had undoubtedly spent the winter. He had found examples of *E. strix* blanketed in precisely the same way during the winter months. Unfortunately he had never been able to make a mid-winter journey to this favorite spider-haunt, in order to see the araneads in extreme hibernation; but he asked some of the young boatmen what the spiders did in winter-time. "They crawl into their bags," one answered, referring to the screens and tubes above described, "and stay there. They came out about a month ago (the last of April), and then 'shed.' A couple of weeks ago the sides of the houses were all covered with these 'sheds'"—by which, of course, the young man meant their moults.

The following was ordered to be printed:—